Chapter 3
AFFECTED ENVIRONMENT

3.0 INTRODUCTION

This Chapter describes the affected environment, including the cultural, historical, social and economic conditions that could be affected by implementation of the alternatives described in Chapter 2. Aspects of the affected environments described in this chapter focus on the relevant major issues presented in Chapter 2. Certain critical environmental components require analysis under BLM policy. These items are presented below in Table 3.0-1.

Table 3.0-1 Critical Elements Requiring Mandatory Evaluation

Mandatory Item	Not Present	No Impact	Potentially Impacted
Threatened and Endangered Species			X
Floodplains		X	
Wilderness Values	X		
ACECs	X		
Water Resources			X
Air Quality			X
Cultural or Historical Values			X
Prime or Unique Farmlands	X		
Wild & Scenic Rivers	X		
Wetland/Riparian		X	
Native American Religious Concerns			X
Hazardous Wastes or Solids		X	
Invasive, Nonnative Species			X
Environmental Justice		X	

3.1 AIR QUALITY

The climate of the project area is classified as mid-latitude semi-arid steppe (Trewartha & Horn, 1980). Steppe climate is characterized by large seasonal variations in temperature (cold winters and warm summers) and by precipitation levels that are low but still sufficient for grasses. For more information on climate, see the Air Quality Technical Report for the Badger Hills POD environmental assessment.

Table 3.1-1: Summary of Existing Air Quality and Climate in the CX Field Region

Air Quality Component	Comment
Climate	
Temperature	Mean annual maximum: 60 °F Mean annual minimum: 32 °F
Precipitation	Mean annual precipitation: 14.7 inches Mean annual snowfall: 37.7 inches Mean annual snow depth: 1 inch
Air Pollutant Concentrations	
MAAQS & NAAQS: Criteria pollutants from 1993 – 2003 Rosebud County, Montana	• NO_2: o 1 hour < 15% of MAAQS o annual < 10% of MAAQS • PM_{10} o 24 hour: o 1 exceedance 2003 o annual < 70% of MAAQS • SO_2 o 1 hour < 20% of MAAQS o 3 hour < 5% of NAAQS o 24 hour < 5 MAAQS o annual < 10% of MAAQS
PSD Class I Increments (MDEQ, 2002)	• Yellowstone National Park o .02% of PSD Class I NO_2 annual o .6% of SO_2 annual o 11% of SO_2 24 hour o 7.2% of SO_2 3 hour o .1% of PM_{10} annual o 2% of PM_{10} 24 hour • North Absaroka Wilderness o .04% of PSD Class I NO_2 annual o 2% of SO_2 annual o 15.6% of SO_2 24 hour o 12.3% of SO_2 3 hour o .3% of PM_{10} annual o 3.9% of PM_{10} 24 hour • UL Bend Wilderness o .02% of PSD Class I NO_2 annual o .6% of SO_2 annual o 11% of SO_2 24 hour o 7.2% of SO_2 3 hour o .1% of PM_{10} annual o 2% of PM_{10} 24 hour • Northern Cheyenne Reservation o 50% of PSD Class I NO_2 annual o .25% of SO_2 annual o SO_2 24 hour exceedance o SO_2 3 hour exceedance o 3.5% of PM_{10} annual o 28% of PM_{10} 24 hour
Visibility	
Yellowstone National Park	• cleanest 20%: 140 – 168 miles • average:93 – 125 miles • haziest 20%: 59 – 78 miles
Atmospheric Deposition	
Little Big Horn Battlefield National Monument	• precipitation o pH: very slight acidification in 1998 & 1999 o SO4: <.8 mg/L • Wet deposition o SO4: < .4 kg/ha
Yellowstone National Park	• Total Sulfur: <50% of guidelines

Under the Clean Air Act of 1970, EPA developed primary and secondary National Ambient Air Quality Standards (NAAQS) for each of the six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. These standards establish pollution levels in the United States that cannot legally be exceeded during a specified time period.

Primary standards are designed to protect human health, including "sensitive" populations, such as people with asthma and emphysema, children, and senior citizens. Primary standards are designed for the immediate protection of public health, with an adequate margin of safety.

Secondary standards are designed to protect public welfare, including soils, water, crops, vegetation, buildings, property, animals, wildlife, weather, visibility and other economic, aesthetic, and ecological values, as well as personal comfort and well-being. Secondary standards were established to protect the public from known or anticipated effects of air pollution.

Montana has adopted additional state air quality standards that are at least as stringent as the NAAQS. These Montana Ambient Air Quality Standards (MAAQS) establish statewide targets for acceptable amounts of ambient air pollutants to protect human health. NAAQS and MAAQS establish upper limits for concentrations of specific air pollutants. Table 3.1-1 summarizes the NAAQS and MAAQS.

Table 3.1-2 National and Montana Ambient Air Quality Standards

Pollutant	Time Period	Federal (NAAQS)	Montana (MAAQS)
Carbon Monoxide	Hourly Average	35 ppm [a]	23 ppm [a]
	8-Hour Average	9 ppm [a]	9 ppm [a]
Fluoride in Forage	Monthly Average		50 µg/g [b]
	Grazing Season		35 µg/g [b]
Hydrogen Sulfide	Hourly Average		0.05 ppm [a]
Lead	90-Day Average		1.5 µg/m^3 [b] (rolling)
	Quarterly Average	1.5 µg/m^3 [b] (calendar)	
Nitrogen Dioxide	Hourly Average		0.30 ppm [a]
	Annual Average	0.053 µg/m^3	0.05 ppm [b]
Ozone	Hourly Average	0.12 ppm [c]	0.10 ppm [a]
PM-10 (existing)	24-Hour Average	150 µg/m^3 [d,j]	150 µg/m^3 [d,j]
	Annual Average	50 µg/m^3 [e]	50 µg/m^3 [e]
PM-10 (revised	24-Hour Average	150 µg/m^3 [f,j]	
	Annual Average	50 µg/m^3 [e]	
PM-2.5	24-Hour Average	65 µg/m^3 [g,j]	
	Annual Average	15 µg/m^3 [h]	
Settleable Particulate	30-Day Average		10 g/m^2 [b]
Sulfur Dioxide	Hourly Average		0.50 ppm
	3-Hour Average	0.50 ppm [k]	
	24-Hour Average	0.14 ppm [j,k]	0.10 ppm [a,j]
	Annual Average	0.03 ppm [k]	0.02 ppm [k]
Visibility	Annual Average		3 X 10 -5/m [k]

Source: http://www.deq.state.mt.us/AirQuality/Planning/Air_Standards/AIR_STANDARDS.pdf

a. Federal violation when exceeded more than once per calendar year.

b. Not to be exceeded (ever) for the averaging time period as described in the regulation.

c. Not to be exceeded more than once per year averaged over 3-years.

d. Violation occurs when the expected number of days per calendar year with a 24-hour average above this concentration is more than one.

e. Violation occurs when the expected annual arithmetic mean concentration is above this concentration.

f. To attain this standard, the 99th percentile of the distribution of the 24-hour concentrations for one year,

averaged over three years, must not exceed this concentration at each monitor within an area.
g. To attain this standard, the 98th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.
h. To attain this standard, the 3-year average of the annual arithmetic mean of the 24-hour concentrations from a single or multiple population oriented monitors must not exceed this concentration.
i. State violation when exceeded more than eighteen times in any 12 consecutive months.
j. The standard is based upon a calendar day (midnight to midnight).

Under the EPA approved State Implementation Plan, MDEQ is the primary air quality regulatory agency responsible for determining potential impacts from detailed development plans that exceed Montana Air Quality Permit (MAQP) thresholds. Emission levels from the exploration portion of the preferred alternative (Alternative C), as well as the exploration portion of Alternative A and Alternative B, are below the 25 ton per year MAQP threshold, except for NO_x emissions from the drill rig stationary engine. However, ARM 17.8.744(1)(i) exempts drill rigs that have the potential to emit less than 100 tons per year and that do not operate in the same location for more than 12 months from the need to obtain a MAQP. Therefore, a MAQP permit would not be required for the exploration activities of the proposed project. Several facilities that would be used to process and transport the CBNG have already received MAQPs from MDEQ. Based on information provided by Fidelity, two existing field compressor stations and three previously permitted field compressor stations that have not yet been constructed would be used to process the gas. The two existing field compressor stations are the BCPL Visborg 25 Battery and the BCPL Montana State 36 Battery. The three previously permitted field compressor stations that have not yet been constructed are the BCPL Rancholme 21 Battery, the BCPL Rancholme 28 Battery, and the BCPL Rancholme 29 Battery. In addition, the existing sales battery, BCPL Symons Central Compressor Station, would also be used for Fidelity's Coal Creek POD. MDEQ previously determined that all of the field compressors and the sales battery require MAQPs and each facility has received a final MAQP. MDEQ would need to be contacted to determine whether a MAQP would be required for any future development, such as additional compressor stations or any other sources of air contaminants that are outside the scope of the proposed project or that do not already have a valid MAQP.

Incremental increases in the ambient concentration of criteria pollutants are regulated under the New Source Review - Prevention of Significant Deterioration (PSD) program. The program is designed to limit the incremental increase of specific air pollutants from major sources of air pollution above a legally defined baseline level, depending on the classification of a location. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. The project area and surrounding areas are classified as PSD Class II. The closest PSD Class I area, the Northern Cheyenne Indian Reservation, lies approximately 18.5 miles northeast of the project.

The proposed project's potential to emit any regulated air pollutant is well below the PSD threshold of 250 tons per year for non-listed sources and the proposed project is not a listed source. Therefore, PSD does not apply to the proposed project. In addition, the PSD minor source baseline date has not been triggered for any regulated pollutant for the area that the proposed project would take place because there are no PSD sources that significantly impact the proposed project area. Therefore, a PSD increment consumption analysis is not required for the proposed project because the proposed project would not consume increment. Furthermore, ARM 17.8.807 exempts concentrations of oxides of sulfur (SO_x), particulate matter (TSP), or NO_x emitted from stationary sources attributable to the temporary increase in emissions from consuming increment if the time period for the temporary increase in emissions does not exceed 2 years, does not impact a Class I area or an area where an applicable increment is known to be violated, and does not contribute to a violation of the NAAQS.

Although the proposed project is not subject to PSD, the five permitted field compressor sites, BCPL Visborg 25 Battery (MAQP #3302-00), BCPL Montana State36 Battery (MAQP #3303-00), BCPL Rancholme 21 Battery (3334-00), BCPL Rancholme 29 Battery (MAQP #3335-00), and BCPL Rancholme 28 Battery (MAQP

3337-00), and the existing sales battery, Symons Central Compressor Station (MAQP #3250-00) that would be used to process the gas from the proposed wells have applied for and received MAQPs from the MDEQ. MDEQ requests operators of all CBNG compressor stations to perform ambient air quality modeling to demonstrate compliance with the MAAQS/NAAQS. In addition, MDEQ requests that the modeling include a NO_x PSD increment analysis to demonstrate compliance with the Class I NO_x increment and periodically the Class II NO_x increment, regardless of whether or not PSD applies to the facility. The ambient air quality modeling that was conducted for the permitted facilities that would be used to extract the CBNG from the proposed wells is summarized in Chapter 4 of this EA.

Refer to the Air Quality Technical Report for the Badger Hills POD environmental assessment for additional information.

3.1.1 Existing Visibility

Visibility values in Yellowstone National Park from 1992 through 2001 are displayed in Figures 3.2.4-1 through 3.2.4-3, Appendix 3, of the Badger Hills EA. Visual range on the 20% cleanest days varies from 140 to 168 miles. Average visual range varies from 93 to 125 miles. Visual range for the 20% haziest days varies from 59 to 78 miles. Trend analysis of Yellowstone visibility data reveals no significant trend of worsening visibility from 1992 through 2001.

Visibility monitoring has begun in North Absaroka Wilderness, Fort Peck Reservation and the Northern Cheyenne Reservation. Those data are not yet available.

3.1.2 Existing Atmospheric Deposition

3.1.2.1Wet Deposition

The precipitation pH in the Little Big Horn Battlefield National Monument near the Northern Cheyenne Reservation from 1987 through 2002 is displayed in Figure 3.2.5-1, Appendix 3 of the Badger Hills EA. The natural acidity of rainwater is considered to be represented by a range of pH values from 5.0 to 5.6 (Seinfeld, 1986). Mean annual pH near the Northern Cheyenne Reservation is generally within this range, although mean annual pH fell to 4.9 in 1998 and 1999. Precipitation pH values lower than 5.0 may be considered acidification and may cause adverse effects to plants and animals.

Figure 3.2.5-2, (Appendix 3, Badger Hills EA), shows mean annual sulfate concentrations in precipitation in the Little Big Horn Battlefield National Monument from 1984 through 2002. All values are below .8 mg/L.

Figure 3.2.5-3, (Appendix 3, Badger Hills EA), shows wet sulfate deposition in the National Monument. All values are below .4 kg/ha.

3.1.2.2Dry Deposition

No dry deposition data is available for eastern Montana.

3.1.2.3 Total Deposition

Figure 3.1.5-4, (Appendix 3, Badger Hills EA), compares total sulfur deposition in Yellowstone National Park from 1992 through 1999 with the total sulfur deposition guidelines set for the Bridger Wilderness. Total sulfur deposition values are well below guidelines.

3.2 CULTURAL RESOURCES

3.2.1 Cultural Resources

BLM's 8100 Manual defines cultural resources as "a definite location of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. This includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups.

The area considered for this analysis and for purposes of compliance with the National Historic Preservation Act (NHPA) was principally the project area regardless of surface ownership. Some additional analysis focused on sites in surrounding areas. However, the Area of Potential Effect (APE) is limited to the project area boundaries. Cultural resource surveys focused on specific areas within the project area that would be disturbed or where impacts could be directly or indirectly tied to the POD.

A review of BLM Cultural Resource Records shows that cultural resource work has been undertaken in the project area since the early 1970's. Site types previously recorded in the area consist of lithic scatters, stone circle sites, cairns, rock shelters, rock art, final resting

places, bison kills and historic sites related to the 19th and 20th Century development of the area. Previous cultural resource and ethnographic projects have shown several of these to be sensitive to Native American groups with ties to the area.

Previous Cultural Resource Inventories in the Coal Creek POD area: BLM records and the State Historic Preservation Office Cultural Resource database indicate that a number of cultural resource inventories were undertaken in the project area dating back to the early 1970's. Only portions of the Coal Creek POD have been previously inventoried for cultural resources at varying levels of survey intensity, which probably would not meet today's survey standards. These previous inventories were conducted for proposed coal mines. These inventories include:

The 1975 Archaeological Survey and Testing of Decker Coal Company Lands (Section 23, 24) (Fredlund 1975); Archaeology of East Decker and North Extension (Section 23, 24) (Fredlund 1977); Three Cultural Resource Projects Near Decker, Montana (Section 23) (Fredlund 1978); Historic and Archaeological Resources of the East Decker Area (Section 9, 16) (Murray 1973); Preliminary Report: Archaeological Survey on Decker Coal Company Lands (Sec 19) (Fredlund 1975). Numerous small project surveys have also been conducted within the POD.

Only 4 sites have been identified and recorded through previous inventories within the POD area. These include 3 lithic scatter sites, 24BH1557, 24BH1558 and 242BH1559 and one historic building, 24BH1750.

A review of properties listed on the National Register of Historic Places reveals that the two closest properties to the POD area are the Wolf Mountain Battlefield and the Lee Homestead. Neither site is located in the vicinity of the proposed project area.

Cultural Resource Inventories for Coal Creek POD: BLM required the company to conduct cultural resource inventories of the Area of Potential Effect for all of the surface disturbing actions associated with the Federal portions of the proposed project that might have the potential to effect cultural resources. Areas of high relief where CBNG development could or would not likely occur were excluded from the inventory areas. As a result, approximately 3,585 acres or approximately 53% of the 6,790 acre POD area was inventoried at the Class III level for cultural resources. The area of inventory included 1,027 acres of federal surface, 265 acres of state surface and 2,293 acres of private surface. The total area of disturbance affected by the Proposed Action (federal undertaking) would be approximately 176 acres or only 2.5% of the POD area and Area of Potential Effect.

The initial inventory and identification strategy employed for this project began by conducting 10 acre surveys around individual proposed well sites and 400 foot wide survey corridors for linear facilities. Subsequent project design changes by the company and changes necessitated by various resource concerns, resulted in additional addenda inventories that tended toward larger block surveys of the affected areas ("A Cultural Resources Investigation for Proposed Well Pads & Ancillary Facilities at Coal Creek in Big Horn County, Montana", John Pauley, et al 2003 and various addenda, James Strait, and Lynelle Peterson 2004) (BLM Cultural Resources Report MT-020-04-442). Results of the various Class III inventories and subsequent addendums, including a summation of the inventory efforts conducted to date for the Coal Creek POD, are on file at the Miles City Field Office.

Cultural Resource Inventory Findings: (Sites within the Coal Creek POD and Adjacent Sections): Class III cultural resource inventories were completed by Ethnoscience of Billings, Montana, for the specific portions of the project area consisting of those portions determined to be the part of the federal undertaking. Results of these inventories are documented in the report entitled "A Cultural Resources Investigation for Proposed Well Pads & Ancillary Facilities at Coal Creek in Big Horn County, Montana", John Pauley, et al 2003 and various addenda, James Strait, and Lynelle Peterson 2004) (BLM Cultural Resources Report MT-020-04-442).

These inventories have resulted in only 6 sites to have been identified and recorded within the POD area and Area of Potential Environmental Effect for this undertaking. These include 3 lithic scatter sites, 24BH1557 (private surface), 24BH1558 (private surface) and 242BH1559 (State surface) and 3 historic homestead sites,

24BH1750 (BLM surface), 24BH3072 (private surface) and 24BH3197 (private surface).

All are outside the area of direct impact of the proposed facility development. Of these 6 sites within the POD area and APE, 2 sites are determined to be within the area of indirect impact for the proposed facility development. These sites are 24BH1559 on State lands and 24BH3072 on private lands.

Sites 24BH1559, a lithic scatter site, and 24BH3072, an historic homestead site, have not been evaluated for eligibility to the National Register of Historic Places.

A review of sites located and recorded in the sections surrounding the Coal Creek POD area in T. 9 S., R. 40 E. reveals that there are 2 sites in Section 13, 24BH1976 (drive lines-cairns) and 24BH2270 (historic structure); 3 sites in Section 14, 24BH1977 (lithic scatter), 24BH1979 (lithic scatter) and 24BH2271 (historic structure); 2 sites in Section 15, 24BH608 (historic site) and 24BH2720 (historic homestead); 2 sites in Section 22, 24BH1064 (lithic scatter) and 24BH2720 (historic homestead); 3 sites in Section 27, 24BH2188 (historic homestead), 24BH2351 (historic homestead) and 24BH2613 (kill-processing site). In T. 9 S., R. 41 E., there are 3 sites in Section 10, 24BH1015 (lithic scatter), 24BH1916 (lithic scatter) and 24BH1556 (lithic scatter); and 2 in Section 15, 24BH1554 (stone ring) and 24BH1555 (kill-processing site). Only 2 of these sites, 24BH2271 (historic structure) in Section 14 and 24BH2613 (kill-processing site) in Section 27, have been determined eligible for the National Register of Historic Places.

For all but 4 of the other sites, National Register eligibility remains undetermined or unresolved. Only sites 24BH2720 (historic homestead) sites in Section 13, two sites in Section 22, 24BH1064 (lithic scatter) and 24BH2720 (historic homestead) and 24BH2351 (historic homestead) in Section 27 have been determined ineligible for the National Register of Historic Places.

Cultural Landscapes: In addition to the National Register eligibility of individual sites, the project area was also examined for the presence of historic districts and Cultural Landscapes. An analysis was undertaken examining the project area for the presence of the various types of landscapes. The Secretary of the Interior's Guidelines for the Treatment of Cultural Landscapes list's several types of landscapes. These include historic sites, historic designed landscapes, ethnographic landscapes, and historic vernacular landscapes.

A cultural landscape is defined as "a geographic area, including both cultural and natural resources (including the wildlife and domestic animals) associated with an historic event, activity or person or exhibiting other types of cultural or aesthetic values." Cultural landscapes are usually defined as those created through human action and intervention, as distinguished from the physical landscape which describes an area's landforms. The term cultural landscape serves as an umbrella term that includes 4 general landscape types: historic designed landscapes, historic vernacular landscapes, historic sites and ethnographic landscapes. All 4 of these types of landscapes may be considered for eligibility under National Historic Preservation Act. No historic or cultural landscapes were identified within or surrounding the project area (POD).

One of the more recent significant events to have occurred the region, however, not within the Coal Creek POD project boundaries, were several skirmishes and battles, along with campsites and trail use through the area, as part of the Sioux War of 1876. The nearest battle site was the Tongue River Heights skirmish site, located on a high point overlooking the Tongue River on the border of Wyoming and Montana some 3 miles to the west of the project area primarily in Section 33, T. 9 S., R. 40 E. in Montana and in Section 23, T. 58 N., R. 83 E. in Wyoming. Second, a campsite associated with the Sioux and Cheyenne, under the leadership of Crazy Horse and Two Moons, is located on the east side of the Tongue River near the mouth of Deer Creek on the Tongue River, outside and north of the POD area. In addition, some travel routes used by the combatants, both the military and Native Americans, to and from some of the local battles may have traversed through the POD area. However, the National Park Service has determined that the routes used during the Sioux War do not meet the criterion of significance through historic usage, as defined by the National Trails System Act. Although the area has been and is important for Native American cultures, there are no defining characteristics that define the area as an ethnographic landscape.

3.2.2 Traditional Cultural Values

An ethnographic overview of Southeast Montana (Peterson and Deaver 2002) was also conducted for the region containing the POD project area. The study identified water and a number of site types as culturally sensitive and also urge avoidance of all sites where possible. The Northern Cheyenne Tribal Document (NCT 2002) also identified a number of site types as being culturally sensitive to the tribe. These include large stone ring sites, isolated fasting beds, rock art sites and large diameter fasting structures such as medicine wheels. Although the area may contain these features of concern, such as burials, which may be marked by cairns, communal kills sites, eagle trapping pits, fasting beds, stone rings, petroglyphs or rock art, vision quest sites and environmental locations where plants, water or mineral are gathered, the ethnographic study did not identify an ethnographic landscape or any Traditional Cultural Properties within the Coal Creek project area, nor did the cultural resource inventory of the POD area identify any such sites.

Native American Consultation: The Bureau of Land Management, as part of its responsibilities to consult with the Native Americans in accordance with Section 106 of the National Historic Preservation Act, contacted 15 Tribal groups consisting of the Northern Cheyenne tribal historic preservation officer, the Crow Cultural Commission, Fort Peck Tribes, Lower Brule Sioux Tribe, Rosebud Sioux Tribe, Pine Ridge Sioux, Cheyenne River Sioux, Eastern Shoshone Tribe, Standing Rock Sioux, Northern Arapahoe Tribe, Blackfeet Tribe, Ft. Belknap Community Council, and the Chippewa-Cree Tribe of the Rocky Boy's Reservation. These 15 Tribal groups were sent a letter dated August 3, 2004, seeking Native American input on this project. The letter summarized the proposed undertaking and solicited tribal input on the proposed development.

A series of follow-up telephone calls were made on August 25 and 26, 2004, and on September 15, 2004, to the addressees on the mailing list. No formal responses were received from any of the groups. Numerous phone calls to these groups were not returned. Of these groups, contact was only made with Gilbert Brady (THPO) of the Northern Cheyenne Tribe, George Reed (Crow Cultural Commission Chairman) of the Crow Tribe, Curly Youpee (Fort Peck Cultural Committee representative) of the Fort Peck Tribes and Tim Mentz (THPO) of the Standing Rock Sioux Tribe.

Tim Mentz of the Standing Rock Sioux Tribe had no comments, while Curly Youpee of the Fort Peck Tribes only wanted to set up consultation procedures so that the tribe could be kept abreast of CBM development activities. Attempts were made to schedule a field tour with George Reed of the Crow Tribe, but he was unavailable. Phone messages to the Cultural Commission office were never returned. Gilbert Brady of the Northern Cheyenne Tribe was the only individual to express interest in CBNG development and interest in further consultation on CBNG projects.

BLM's Miles City Field Office's consultation effort was conducted in good faith with the Northern Cheyenne and the other Tribal interests by providing ample opportunity to comment. A field tour of the project area was conducted for a member of the Northern Cheyenne Tribe on December 20, 2004. However, no substantive comments were received.

In the absence of comments, BLM plans to proceed based on previous comments received from both the approved Powder River Gas Coal Creek POD (approved 11/19/04) and the recently approved Dry Creek POD (approved 12/16/04). Consultation and field tours of these two adjacent PODs did not identify any areas of significance or concern to the Northern Cheyenne, nor did the areas contain any traditional cultural properties.

The previous consultations with the Northern Cheyenne resulted in recommendations for a tribal representative to monitor certain surface disturbing construction activities, as a result of POD developments, in the vicinity of sites. Consequently, a statement was incorporated into the COA, identifying the need for the company to conduct monitoring of sites during the construction phase. In the absence of specific comments on the Coal Creek POD project area, BLM assumes that similar results would be found in the Coal Creek POD area. Consequently, BLM will apply similar Conditions of Approval as were applied to the previous PODs. BLM's Miles City Field Office has prepared Conditions of Approval that will become part of the Record of Decision and will be part of approved APDs issued for the Coal Creek POD.

3.2.3 Paleontological Resources

Paleontological Resources are defined as fragile and nonrenewable scientific record of the history of life on earth (BLM, 1998). Fossils of the Cenozoic's Paleocene epoch (65 to 54 million years ago) have been found in the Fort Union Formation throughout Wyoming and Montana, but no important localities have been identified in the project area. Vertebrate fossil remains are particularly nonexistent in the Tongue River Member of the Fort Union Formation which is the upper most formation within the POD project area. Paleobotanical fossils have been recovered from the Tongue River Member but not within the project area. Past studies of paleontological resources at the Spring Creek and proposed CX Decker Mines have shown that the POD area has a low potential to yield significant vertebrate fossil remains. Fossils located in the Spring Creek Mine area include plant, amphibian, reptile and invertebrates. The POD area occurs in similar geologic formations as the Spring Creek Mine and similar paleontological resources may occur. Protection of fossil resources on public lands extends to vertebrate fossils or specially designated areas. No areas designated for special management for paleontological resources are located near the project area in Montana. Although invertebrate fossils are not usually considered significant and permitable paleontological resources (the need to obtain a permit to collect), they do have cultural values to Native American groups and require consideration under laws and executive orders that deal with access and maintenance of religious sites and resources on public lands (Peterson and Deaver, 2002). Fossils on split estate lands are considered part of the surface estate and belong to the surface owner (BLM, 1998). Unanticipated discoveries of paleontological resources during project activities will be dealt with through implementation of measures in the approved federal permit that require notification of BLM's authorized officer in the event of important discoveries and suspension of construction activity to prevent loss of significant paleontological values.

3.3 GEOLOGY AND MINERALS

3.3.1 Geology

The project area lies in the northern portion of the Powder River Basin. The Powder River Basin is an asymmetrical, northward plunging, sedimentary basin; its structural axis is located closer to the west flank of the basin than the east side.

The project area is also near the basin axis with the rock strata dipping gently to the south, southwest about 1° to 2° although localized structures, such as faulting and folding can cause steeper dips or changes in dip direction.

Numerous faults occur in the area in a fault zone just north of the Montana, Wyoming state line. These faults trend from southwest to northeast, are typically down dropped to the south and may have displacements of up to 150 feet as in the Spring Creek and Carbone faults located at the Spring Creek Coal Mine. Four possible faults have been mapped within the project area and several more are located on both east and west sides of the project area. Technical data on these faults is currently unavailable.

Outcropping bedrock in the area consists of the Tertiary-age Wasatch and Fort Union Formations. The Wasatch Formation is the predominant surface formation present in the project area. It unconformably overlies the Fort Union Formation. The Wasatch can be as much as 600 feet thick, and is made up of yellowish to light gray siltstone, massive to crossbedded sandstones, brown carbonaceous shales, coal seams and red clinker. A brown layer of gastropod shells (coquina) about 6 to 8 inches thick is found about 200 feet above the base of the Wasatch in many areas (Vuke, 2001).

The Fort Union Formation is locally broken into three members (from youngest to oldest): Tongue River, Lebo and Tullock. The oldest member, Tullock, is composed of light-colored sandstone, sandy shale, carbonaceous shale, clay and locally thin, non-continuous coal beds. The middle Lebo Member consists of dark shale, mudstone, carbonaceous shale, siltstone, argillaceous sandstone, and coal. The Tongue River Member contains mineable coal units within the Fort Union Formation and consists of sandstone, interbedded siltstone, shale, and thick coal beds. Local depositional environments of the coal seams resulted in formation of several distinct coal beds within the Tongue River Member.

The Tongue River Member of the Fort Union Formation was deposited in a low-lying coastal or near-coastal area, mainly as fluvial and over-bank mud, and back-swamp peat. This depositional setting formed rock types that change markedly

over short distances, making it difficult to characterize the nature of overburden or inter-burden intervals.

Where sufficient thickness of coal was deposited and conditions were right, the coal burned. The resulting heat baked and fused the overlying material into a brittle resistant reddish rock, locally called "clinker" or "scoria" deposits (Cole, 1980).

Following coal deposition, the general area was faulted, resulting in displacement of coal seams. Faults in the area are generally oriented northwest and northeast (USDI, 2000).

The Fort Union Formation is underlain by Cretaceous-age Hell Creek Formation and is not exposed in the area.

The target coal seams are the Dietz, Carney, and Monarch from 295 feet to 1,258 feet. One hundred thirty-two federal, 62 private, and 16 state wells are planned for these 3 coal seams.

3.3.2 Coal Bed Natural Gas

Coal Bed Natural Gas is held in the coal beds by hydrostatic pressure within the bed. A drawdown of the pressure as the result of pumping water from the coal bed causes the gas to move to the lower pressure in the well bore.

3.3.3 Methane Migration

The objective in pumping the water from the CBNG wells is to reduce the pressure and cause the gas to desorb from the coal matrix and migrate to the CBNG well. In reservoir dynamics, as in hydrology, the flow will be from areas of high pressure to areas of lower pressure. For this reason, the gas will flow towards wells that are pumping water from the coals seam and reduce the pressure enough to cause the gas to be desorbed.

The cumulative effect is more complicated. The pumping of CBNG wells would cause the areas near the wells to desorb the gas and have it flow towards them; however, a reduction in hydrostatic head (pressure) would extend beyond that area over which the gas is desorbed in what is called a “cone of depression”. For this reason, water wells that are finished in a CBNG producing coal seam(s) could produce gas from the water wells at pumping rates that are less than those that would have been required in the past. The water wells would be causing a localized “cone of depression” around the well, which would cause the gas to desorb, and; therefore, the gas flows towards them. This desorption of gas is caused by lower pumping rates than would have been required prior to CBNG production. The cumulative effect of gas migration is also affected by the local Geology of the coal, gas content of the coal and faulting in the area.

The BLM has determined that the potential for methane migration and the potential impacts from the Coal Creek Project are similar to the impacts described in the WY FEIS and Proposed Amendment for the Powder River Basin Oil and Gas Project and the MT FEIS. These could include migration of methane gas to water wells or to the surface.

Methane migration to water wells, springs or monitoring wells: Based on the water draw down analysis for the project, the 20 foot drawdown for the Coal Creek POD would extend from 1 mile to 2 miles from the edge of field. The ongoing CBNG production and the 30 years of coal mining in the area have drawn down the potentometric pressure within the producing area (see Section 3.4.2). A drawdown of 20 feet would be equivalent to a pressure reduction of 8.7 psi in each coal. The gas in the coal requires 10 to 40 percent in pressure reduction before desorbtion begins, the radius of pressure reduction sufficient to cause gas to desorb is much smaller that the 20 foot drawdown radius. The pressure in the Dietz 1, 2 and 3 coal is estimated at 124 psi to 427 psi. To enable gas to desorb from this coal would require a reduction of a minimum of 12.4 psi. This would translate to a water drawdown of at least 29 feet. The East Decker mine has mined the shallowest Dietz coals, therefore, it is likely that this pressure has been reached already and any wells/springs in the Dietz 1 & 2 may already be affected.

In the Monarch coal, the formation pressure is estimated to be from 262 psi to 474 psi. This coal would require a minimum of 26.2 psi reduction of pressure before gas would begin to desorb. This translates to a water drawdown of 61 feet.

In the Carney coal, the formation pressure is estimated to be from 280 psi to 547 psi. This coal would require a minimum of 28 psi reduction of pressure before gas would begin to

desorb. This translates to a water drawdown of 65 feet.

Based on the Hydrology section (3.4.2), there are monitoring wells, water wells or springs within this area that may be affected by methane migration. The wells or springs would have to be completed or producing from a coal bed and within the minimum drawdown area to cause desorbtion. The radius of the minimum drawdown is shown above for each coal.

The operator has certified that water mitigation agreements have been reached with all potentially affected owners of wells and springs in accordance with the requirements of MBOGC Order No. 99-99. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater, and to extend this area one-half mile beyond any well adversely affected. This order applies to all wells and springs, not just those which derive their water from the developed coal seams. This Order requires "…prompt supplementation or replacement of water from any natural spring or water well adversely affected by the CBM project…" These agreements would apply to those wells which experience an impact to their use whether it is due to decreased yields, the migration of methane, or a change in water quality.

Drainage of Indian Mineral resources: The nearest Crow Indian minerals are more than 9 miles to the west of the POD project area. Because of the pressure drawdown mentioned below, there would be no drainage of Crow mineral resources as a result of the approval of this project.

The nearest Northern Cheyenne lands are approximately 4 miles away (NW¼SW¼, Section 24, T. 8 S., R. 40 E.). A study completed by the Reservoir Management Group of the Casper BLM office indicated that the pressure would have to decline between 10 to 40 percent before gas would begin to desorb from the coals in the Powder River Basin. The initial pressure in the Dietz coal (the shallowest being tested) is approximately 124 psi to 427 psi. This means that the pressure in the Dietz would have to be reduced by at least 12.4 psi and possibly as much as 42.7 psi before gas might begin to desorb. The Monarch coal would have an initial pressure of 262 psi to approximately 474 psi. This coal would have to be drawn down at least 26.2 psi and as much as 47.4 psi before gas might desorb. The Carney coal would have an initial pressure of 280 psi to approximately 547 psi. This coal would have to be drawn down at least 28 psi and as much as 54.7 psi before gas might desorb. The drawdown required in the Dietz before gas might be desorbed would be 29 feet as a minimum and it could be as much as 99 feet. The drawdown required in the Monarch before gas might be desorbed would be 61 feet as a minimum and it could be as much as 109 feet. The drawdown required in the Carney before gas might be desorbed would be 56 feet as a minimum and it could be as much as 126 feet.

Table 3.3.3-1: Expected Drawdown per Coal Zone

Coal Bed	Min. Drawdown to desorb	Radius of Min. Drawdown
Dietz 1	29 feet	.96 miles
Dietz 2	39 feet	.49 miles
Dietz 3	46 feet	.31 miles
Monarch	61 feet	.13 miles
Carney	65 feet	.11 miles

As shown in the Hydrology Appendix, the maximum 20 foot drawdown radius after 20 years production is 1.6 miles from the edge of the field. The 20 foot drawdown would only result in a pressure drawdown of 8.7 psi. This is not enough to cause gas to desorb or be drained from any of the coals that are proposed to be produced in this POD. The nearest Northern Cheyenne lands are over 4 miles away, there will be no drainage of methane from them.

Methane migration to conventional wells in the area: There is one abandoned conventional oil well within the project area, a well in Section 19 and a plugged CBNG well in Section 30 of T. 9 S., R. 41 E. The nearest plugged conventional well outside the POD area is located in the SW¼NE¼ of Section 9, T. 9 S., R. 41 E. All the conventional wells that are in or near this POD area are listed below. The wells in Sections 16 and 17 are inside the Decker Mine boundary and

have had the surface casing removed and been re-plugged below the level of mining operations. They should not provide a conduit for methane migration to the surface. The well in Section 19 has been plugged inside the surface casing so it should not provide a conduit for methane migration to the surface.

Table 3.3.3-2: Conventional Oil & Gas Wells

Well	Location	Total Depth
1	NENE 17-T9S-R40E	8334 feet
1	SESE 16-T9S-R40E	3485 feet
D-6	NWNE 19-T9S-R41E	8850 feet
1	SWNE 9-T9S-R41E	795 feet

Drainage of Federal Mineral resources: Federal minerals butt directly up to the north and east of the proposed POD area. Due to this situation, there may be drainage situations identified as the wells in the POD begin producing. These situations will be handled on a case by case basis.

3.4 HYDROLOGY

3.4.1 Surface Water

Under the proposed action, the water produced from the CBNG wells would be (1) discharged to the Tongue River using Fidelity's existing MDEQ discharge permit (MT-0030457); (2) beneficially used for industrial uses (dust suppression) in the Spring Creek Coal mine; (3) beneficially used by Fidelity for CBNG drilling, construction, and dust suppression; (4) beneficially used for stock and wildlife; (5) stored in the existing off drainage impoundment 23-0299; (6) stored in off drainage impoundment 44-3490, which was authorized in the Badger Hills POD, but has not yet been constructed; or (7) during the irrigation season, applied to the managed irrigation areas which were authorized in the Badger Hills POD, but are not in use at this time.

The beneficial use of this water by the Spring Creek mine, Fidelity, and for stock and livestock water is not anticipated to result in noticeable impacts, since these uses will be dispersed such that saturated flow to groundwater will not occur, and these uses will not result in discharges to surface waters. As such, these beneficial uses will not be analyzed in detail. Fidelity has obtained an interim permit to appropriate water from the DNRC for this project which allows the produced water to be used beneficially.

Off drainage impoundment 23-0299 is an existing impoundment on fee surface/fee minerals which has been approved by MBOGC. As such, it can be approved under Onshore Order #7. This impoundment is used for watering livestock. It is not anticipated that water will infiltrate through the base of this reservoir due to the base being composed of clay, and the CBNG water having a high SAR. When high SAR water is placed in an impoundment that has an appreciable clay content (>~30%), the clay deflocculates and causes the impoundment to seal (Bobst and Wheaton, 2004). It is believed that this high SAR water has long since caused the base of the impoundment to become impermeable and it is considered to be a total containment basin, with evaporation being the only route by which water can leave the impoundment. This impoundment does not have the potential to impact ground waters, or to create impacts to surface waters. Since this impoundment is located off drainage near the ridge line, it will not intercept an appreciable volume of runoff, and therefore, will not impact downstream water rights. Upon pit closure, the soils beneath this impoundment will be tested to determine if any salts have evapo-concentrated to hazardous levels, and the soils will be disposed of in accordance with all applicable federal, state, and local laws. As such, this existing impoundment does not have the potential to create impacts to hydrologic resources, and so will not be analyzed in detail.

Off drainage impoundment 44-3490 was approved by the BLM under the Badger Hills POD. As outlined in the EA for that POD, the lining of this impoundment with clay, and monitoring of this impoundment, will be sufficient to ensure that adverse impacts do not result from this impoundment. This impoundment has also been approved by MBOGC, and, as such, it can be approved under Onshore Order #7. This impoundment would be used to store produced water as needed during the non-irrigation season. During the irrigation season, produced water could be applied to the managed irrigation areas approved under the

Badger Hills POD. As analyzed in the Badger Hills EA, the management of the application of water, and the agreed upon monitoring of the managed irrigation areas, would be sufficient to ensure that adverse impacts do not result from these irrigation areas. Since both this impoundment and the managed irrigation areas were analyzed in detail in the Badger Hills POD EA, these facilities will not be analyzed in detail in this EA.

All of the proposed well sites are located in the Upper Tongue River 4th Order Watershed. The northwest corner of the project area intersects the Tongue River which is the only perennial river near the project area. The Tongue River is considered high quality water pursuant to Montana's Non-degradation Policy and degradation of high quality water is not allowed unless authorized by the Department under 75-5-303(3), MCA. The TMDL process for the Tongue River watershed is currently underway.

This analysis will focus on the Tongue River since this is the only stream that would receive CBNG water. Two other unimpaired streams flow through the project area (Coal Creek and an unnamed tributary); however, these ephemeral drainages were not analyzed in detail since they would not receive any CBNG produced water (under any alternative). Similarly, Deer Creek which is not impaired, drains a portion of the project area, however, it would not receive any discharge. Therefore, there would be no effect to these streams and they would remain unimpaired. No other streams drain this project area.

The entire length of the Tongue River below the Tongue River Dam is affected by the presence of the Tongue River Dam. The presence of this dam causes sediment to be trapped behind the dam, and causes the magnitude of peak flows to be reduced, thereby altering the riparian environment (Collier, et al., 1996). The flow along the reach below Pumpkin Creek is also substantially reduced during the irrigation season by the diversion of water at the 12 Mile Dam into the TY irrigation ditch. During low flows, the majority of the water in the Tongue River is diverted at this point, and any measurements taken below this point are more representative of Pumpkin Creek and other minor tributaries than they are of the Tongue River.

The reach of the Tongue River where the discharge is proposed to occur (upstream from the reservoir) is not listed on the MDEQ's current (2002) 303(d) list for impaired streams under the Clean Water Act (CWA), nor is it listed on the Draft 2004 303(d) list. This reach was listed on the 1996 303(d) with the cause of impairment being identified as Flow Alternation; the probable source of this impairment was identified to be Agriculture, Irrigated crop production, and Natural sources (MDEQ, 2003b). Thus, this reach of the Tongue River was listed due to a lack of flow. This reach has been removed from the 2000, 2002, and the 2004 303(d) lists based on reassessment of the water quality.

The portion of the Tongue River from the diversion dam just above Pumpkin Creek (12 Mile Dam for the TY irrigation ditch) to the mouth is currently listed on the 303(d) list, and has been listed since 1996. This portion of the Tongue River is located approximately 100 miles N/NE from the project area (~142 river miles downstream). The MDEQ has identified flow alteration as the probable cause of the impairment, and dam construction and flow regulation/modification as the probable sources of impairment along this downstream reach. Thus, this reach was listed due to a lack of flow.

The proposed action for the Fidelity Coal Creek Project includes the discharge of untreated produced water into the Tongue River between the state line and the Tongue River Reservoir under Fidelity's existing Montana Pollution Discharge Elimination System (MPDES) permit (MT-0030457). A USGS Gaging Station is located on the Tongue River between the state line and the reservoir. Data from this station should be representative of this reach of the Tongue River.

CBNG discharge to the Tongue River is occurring at a rate of approximately 1,085 gpm upstream of the Tongue River Reservoir. This discharge is permitted for up to 1,600 gpm of untreated CBNG discharge. Two other CBNG permits have been submitted to the MDEQ for the Tongue River. These discharges are summarized on Table 3.4.1-1. The recently approved permit for the Powder River Gas (PRG) project (MT-0030660), and the pending Fidelity application (MT-0030724) are both for treated discharges. The Fidelity treated discharge is proposed to be located upstream of

the Tongue River Reservoir. The Powder River Gas discharge will be below the Tongue River Dam. Although the PRG permit has been approved, the wells and infrastructure for this project have not been completed so no discharge is occurring at this time.

Table 3.4.1-1: Existing and Proposed CBNG MPDES Permits

Permit Number	Owner/Operator	Permit Status	Potential Discharge Volume (gpm)	Treated (Y/N)
MT-0030457	Fidelity Exploration & Production Company	Approved	1,600	N
MT-0030660	Powder River Gas, LLC	Approved	1,122	Y
MT-0030724	Fidelity Exploration & Production Company	Application Pending	1,700	Y

This project would not contribute to the impairment of any 303(d) listed streams. There are several reasons for this, including (1) the proposed discharge is small relative to the river at the point of discharge (2.0% of flow at LMM), (2) flows below the dam are controlled by reservoir releases, and (3) 142 miles of tributary inputs and irrigation removals (especially the 12 Mile Dam). Thus, flows in the lower listed reach are a function of agricultural demands and not natural flows or CBNG inputs in the upper basin. In addition, even if this project did cause a measurable increase in flow, the listing is because of decreased flows so this project would not be adding to the impairment.

Prior to the issuance of the MPDES permit, an analysis of all parameters for which surface water quality criteria had been developed was conducted. Surface water quality criteria for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) had not been developed at that time. EC and SAR are primary constituents of concern with CBNG discharges (MDEQ, 2003a), therefore, the discussion in this document will focus on these parameters. Other constituents are addressed in the MDEQ's Statement of Basis (SOB) for Fidelity's MPDES permit MT-0030457.

EC is the ease with which electric current will pass through a water sample, and it is proportional to the salinity of the sample. SAR is a complex ratio of sodium to calcium and magnesium, and is an important parameter for determining the utility of water for irrigation due to the potential impacts of sodium on clay rich soils. EC and SAR are the primary factors that determine the usability of water for irrigation, and irrigation is the use that has been determined to be most sensitive to CBNG inputs (MDEQ, 2003a).

Upstream of the reservoir, the modeled results are based upon simple mixing with historical water samples collected between May, 1994 and September, 1995. This time period was chosen because of the relative abundance of data which was available for this time period. Resultant SAR values are calculated from the resultant Na, Ca, and Mg values. The resultant SAR and EC values are then graphed vs. flow, and used to extrapolate water quality values at the flows in question (7Q10, LMM, and HMM). The resultant extrapolated values are adjusted by a constant correction factor to adjust for the difference between the historical record for this site up to September, 1999, and the shorter data set used for this analysis. These constant values were determined by comparing the extrapolated values from the model with no CBNG inputs to extrapolated data using Pre-September, 1999 data. All CBNG discharges above the reservoir were added at this station and mixed.

Below the dam, the resultant water quality data are based upon the inputs from upstream of the reservoir from May, 1994 to September, 1995 being mixed with the coal mine discharges into the reservoir during this time, and complete mixing in the reservoir. The effect of the reservoir is to moderate the variability of water quality (i.e. the water quality at the State Line station above the reservoir is more variable than the water quality at the station below the Tongue River Dam). This approach is supported by the historical record of water quality above and below the reservoir. This approach does not take into account evaporation, infiltration, or chemical reactions in the reservoir. The treated CBNG discharge from PRG under the cumulative analysis was added to the results

from this mixing at the station below the dam. A constant correction factor which was determined from the difference between the extrapolated values from Pre-September, 1999 data, and the results from using the shorter data set for this analysis was also applied to these results.

The water quality at Birney Day School was determined by adding the historical increase in EC and SAR, at the flows in question, between the station below the Dam and the station at Birney Day School to the results from below the Dam. This constant correction factor also serves to adjust for the difference between the extrapolated values from the Pre-September, 1999 data at this site to the results from the shorter data set used in this analysis.

A comparison of historical flow (Pre-Sept, 1999), EC and SAR values to the modeled existing condition is provided in Table 3.4.1-2. These modeled existing conditions will provide for comparison to the direct impacts from the alternatives. With no further CBNG development, it would be anticipated that the rate of CBNG discharge will decrease over time due to the decreasing discharge rate per well over time. According to the water balance prepared in support of this project, after 5 years the rate of discharge to the Tongue River would be anticipated to be 33 gpm if no more CBNG wells were produced.

The historical water quality, as measured by EC and SAR, at the Tongue River stations near the state line, below the dam, and at Birney Day School are shown in Table 3.4.1-2. This historical water quality data was determined based upon USGS data from prior to September, 1999. These Pre-CBNG data do not accurately represent the existing conditions however, since the existing untreated CBNG discharge (MT-0030457) is occurring upstream from the reservoir. The quality of this water is tabulated in Table Hydro-3 of the Hydrology Appendix. It is necessary to model the effect of this discharge at its current level in order to reflect existing conditions. A comparison of historical conditions to modeled existing conditions is provided in Table 3.4.1-2. Calculations are made during low mean monthly flows (LMM; the lowest mean monthly flow value for the station), high mean monthly flows (HMM; the highest mean monthly flow value for the station), and 7Q10 flows (a statistical value indicating the lowest flow that would be anticipated to occur for seven consecutive days over any 10 year period). Analysis is conducted at the State Line station to reflect conditions upstream from the Tongue River Reservoir, at the station below the Tongue River Dam to reflect the effects of mixing in the Reservoir, and at the Birney Day School station, which is located at the southern boundary of the Northern Cheyenne Reservation and provides for comparison to the Tribal Surface Water Quality Criteria. A detailed discussion of this surface water model is provided in the surface water modeling report prepared in support of this POD (Fidelity, 2004b).

Table 3.4.1-2: Comparison of Historical Conditions to Modeled Existing Conditions

	Flow Conditions	Historical (Pre-Sept 99) (0 gpm)			Existing Conditions (1085 gpm)		
		Flow (cfs)	EC (μS/cm)	SAR	Flow (cfs)	EC (μS/cm)	SAR
Tongue River at State Line	7Q10	42.0	1273	1.07	44.4	1302	1.49
	LMM	178.0	682	0.63	180.4	700	0.81
	HMM	1670.0	259	0.27	1672.4	261	0.30
Tongue River Below Dam	7Q10	70.0	814	0.97	72.4	829	1.18
	LMM	179.0	648	0.78	181.4	660	0.92
	HMM	1429.0	390	0.49	1431.4	394	0.53
Tongue River at Birney Day School	7Q10	49.0	1111	1.56	51.4	1126	1.77
	LMM	173.0	714	1.03	175.4	726	1.17
	HMM	1119.0	372	0.56	1121.4	376	0.60

Note: Values in parentheses represent the rate of untreated CBNG Discharge via permit MT-0030457.

A noticeable increase in either EC or SAR has not been observed in USGS monitoring data since the start of CBNG production when values are plotted vs. flow. These data for the Birney

Day School station are shown on Charts 3.4.1-1, and 3.4.1-2. As shown on these charts, the changes that would be anticipated by the model would be within the natural variability of the data, thus this lack of response may be in part due to the natural variability of the data (i.e. signal to noise). This comparison does show that the model used predicts that SAR should be noticeably above the historical trend line, however, monitoring data is scattered evenly on both sides of this line. As such, it appears that the model used is somewhat conservative.

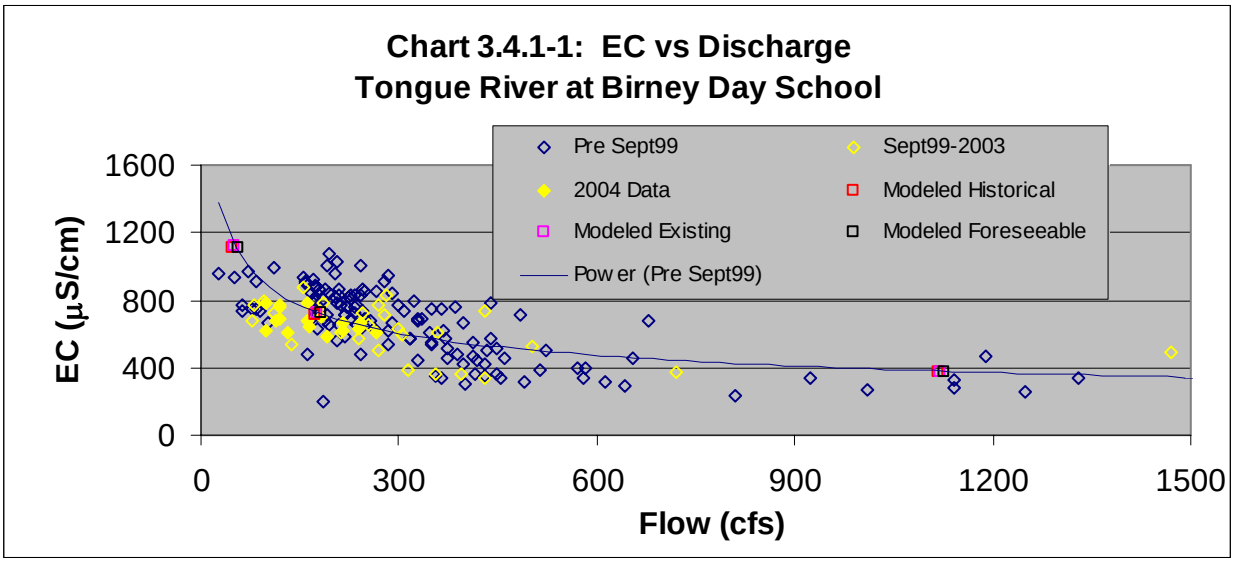

Chart 3.4.1-1: *This chart shows historical (Pre-Sept99) EC (µS/cm) data graphed vs. Flow (cfs) with a power trend line of the historical data. Also shown are data from September 1999-2003, 2004 data, Modeled Historical results, and Modeled Existing results. Data from after September, 1999 are all within the natural scatter of the historical data, with no systematic deviation from the historical trend. As shown by the modeling results, the changes that result from the existing level of CBNG discharge would not be expected to be discernable.*

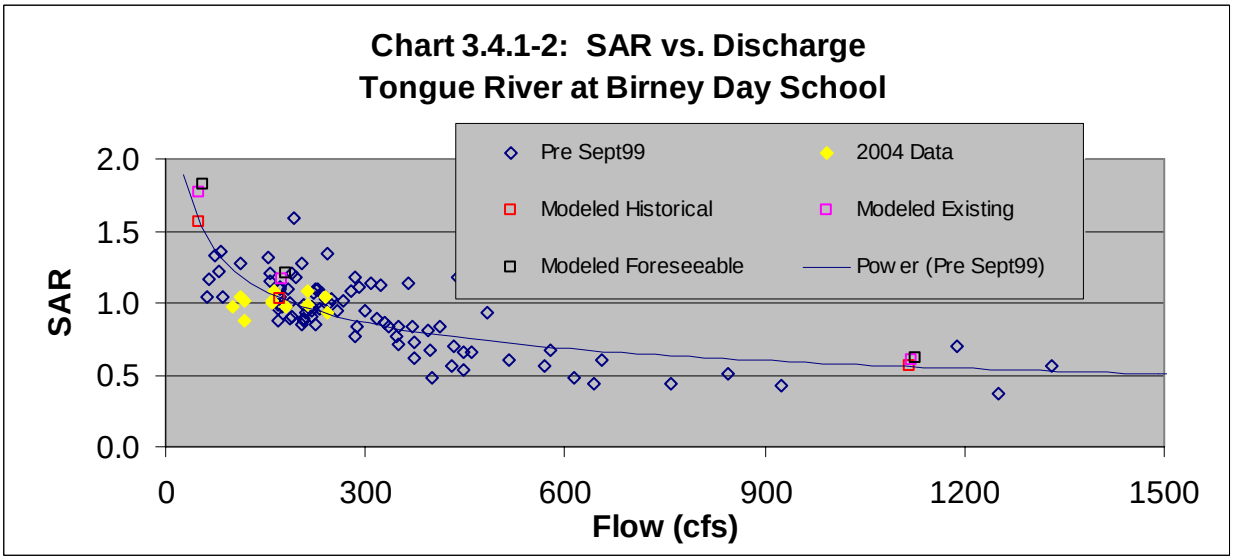

Chart 3.4.1-2: *This chart shows historical (Pre-Sept99) SAR data graphed vs. Flow (cfs) with a power trend line of the historical data. Also shown are data from 2004, Modeled Historical results, and Modeled Existing results. Data from after September 1999 are all within the natural scatter of the historical data, with no systematic deviation from the historical trend. As shown by the modeling results, the changes that*

result from the existing level of CBNG discharge would be expected to show a noticeable increase in SAR; therefore the model used appears to be somewhat conservative.

In addition to the discharges which are currently taking place, it is also necessary to address the potential impacts of the discharge permits which have been applied for or recently approved, and are therefore reasonably foreseeable (see Table 3.4.1-1). The results of this analysis are shown on Table 3.4.1-3. The inputs for this scenario are summarized on Table Hydro-3 in the Hydrology Appendix. These foreseeable conditions will provide for comparison of the cumulative impacts for each alternative.

Table 3.4.1-3: Comparison of Historical Conditions to Foreseeable Conditions

	Flow Conditions	Historical (Pre-Sept 99) (0 gpm)			Foreseeable Conditions (1085 gpm)		
		Flow (cfs)	EC (μS/cm)	SAR	Flow (cfs)	EC (μS/cm)	SAR
Tongue River at State Line	7Q10	42.0	1273	1.07	48.2	1258	1.52
	LMM	178.0	682	0.63	184.2	694	0.84
	HMM	1670.0	259	0.27	1676.2	261	0.30
Tongue River Below Dam	7Q10	70.0	814	0.97	78.7	815	1.23
	LMM	179.0	648	0.78	187.7	658	0.96
	HMM	1429.0	390	0.49	1437.7	397	0.55
Tongue River at Birney Day School	7Q10	49.0	1111	1.56	57.7	1112	1.82
	LMM	173.0	714	1.03	181.7	724	1.21
	HMM	1119.0	372	0.56	1127.7	379	0.62

Note: Values in parentheses represent the rate of untreated CBNG Discharge via permit MT-0030457.

Prior to issuance of the MPDES permit for this discharge, an analysis was conducted in relation to all existing surface water quality criteria in place at that time (see SOB for MT-0030457). Since that time, the Montana Board of Environmental Quality has established surface water standards for EC and SAR under the Montana Water Quality Act. These standards have been reviewed and approved by the EPA, and therefore have Clean Water Act standing. The Northern Cheyenne Tribe has also adopted surface water quality standards for EC and SAR. The Northern Cheyenne Tribe has not been granted "Treatment as a State" status by the EPA, therefore, the EPA has not reviewed these standards. As such, the Northern Cheyenne numerical standards do not have Clean Water Act standing; however, they do set out the Tribe's considered determination of the water quality needed to protect irrigated agriculture on the Reservation (Northern Cheyenne Tribe, 2002), and to protect native plant species that have cultural significance and are integral in ceremonial and traditional aspects of the Northern Cheyenne Tribe. Therefore, the Northern Cheyenne standards provide reasonable criteria against which to compare the resulting water qualities. These various standards are summarized in Table 3.4.1-4.

Table 3.4.1-4: Surface Water EC and SAR Standards for the Tongue River

	Monthly Mean SAR	Inst. Max SAR	Monthly Mean EC (µS/cm)	Inst. Max EC (µS/cm)
MDEQ Irrigation Season[1] Standards	3.0	4.5	1000	1500
MDEQ Non-Irrigation Season[1] Standards	5.0	7.5	1500	2500
Northern Cheyenne Irrigation Season[1] Standards; Southern Boundary	---	2.0	1000	2000
Northern Cheyenne Non-Irrigation Season[1] Standards; Southern Boundary	---	2.0	---	2000

1: The Irrigation Season specified by the MDEQ is from March 1st to October 31st while the Irrigation Season specified by the Northern Cheyenne is from April 1st to November 15th.

For the purposes of this impact analysis, the high mean monthly and low mean monthly results are compared to the mean monthly standards, while the 7Q10 result are compared to the instantaneous maximum standards. This is appropriate since the 7Q10 is the lowest flow that would be expected to occur for 7 consecutive days over any 10 year period. The current water quality at all of the stations modeled meets the water quality standards and is below the thresholds established by the MDEQ and Northern Cheyenne.

For more information regarding surface water, refer to the MT FEIS Chapter 3, Affected Environment, pages 3-22 through 3-31 (BLM, 2003), the Water Resources Technical Report (ALL, 2001), and the Surface Water Quality Analysis Technical Report (SWQATR) (Greystone and ALL, 2003). Real time and historical monitoring data for the Tongue River are also available from the USGS at http://tongueriver monitoring.cr.usgs.gov/index.htm.

3.4.2 Groundwater:

The CBNG wells in the project would be drilled to various depths ranging from approximately 217 feet to 1,258 feet below ground surface (BGS) into the Dietz, Monarch and Carney coal zones (see Appendix A). Of the 210 proposed federal, state and fee CBNG wells, 39 would be finished in the D1 coal seam, 43 would be finished in the D2 coal seam, 43 would be finished in the D3 coal seam, 42 would be finished in the Monarch, and 43 would be finished in the Carney.

All of the coal seams proposed for development are contained within the Tongue River Member of the Fort Union Formation. The Dietz seam is typically split into 3 beds (D1, D2 and D3). In the project area, the D1 coal seam is approximately 33 feet thick, the D2 coal seam is approximately 25 feet thick, and the D3 coal seam is approximately 22 feet thick. The Monarch coal seam is approximately 19 feet thick and the Carney coal seam is approximately 22 feet thick in the project area. Artesian pressure within these coal seams may be up to 300 feet above the top of the seams.

When CBNG is produced, the groundwater levels in the coal seams are drawn down to near the top of the coal seams and then held at that level. This reduces the hydrostatic head within the coal seam and allows the methane to become desorbed from the coal surface and flow to the well. Dewatering of the coal is not desired since this would require excessive pumping of water due to the advent of unconfined conditions (i.e. actual dewatering of the pore spaces vs. reducing the pressure within the coal seam). Also, dewatering would cause the cleat (fractures) within the coal to close up and inhibit the flow of methane to the well. As a result of holding the hydrostatic head just above the top of the coal seam (a constant head situation), the rate of water production per well must decrease over time as the pressure within the aquifer is reduced over an increasing geographic area.

Any drawdown that occurs within the developed coal seam would be limited to that coal seam, and not extend to the overlying or underlying formations. The coals within the Tongue River

member of the Fort Union formation are typically bounded by clay rich strata, and as such the vertical hydraulic conductivity in this formation is very low (Wheaton and Donato, 2004a). Based upon the results of 370 aquifer tests, Wheaton and Metesh (2002) have calculated that the geometric mean horizontal hydraulic conductivity (K) values of the coal seam aquifers in the Fort Union Formation is 1.1 feet per day. Mean storativity (S) values of these coals are approximately $9x10^{-4}$ (storativity is unitless) (Wheaton and Metesh, 2002).

The Montana Bureau of Mines and Geology (MBMG) maintains the Groundwater Information Center (GWIC) database of known wells, springs, and borings in Montana. Under current Montana law, drillers are required to provide well logs to MBMG or indirectly to DNRC for all wells drilled within 60 days of drilling the well. The USGS also has the National Hydrologic Database dataset for this area (Upper Tongue River) which includes wells and springs. The MBMG and USGS datasets are used to determine the wells or springs which are located within the potential drawdown area.

Coal seam groundwater levels in the CX Field have already been drawn down. Coal mines have contributed to this drawdown over the past 30 years of mining activity. More recently, CBNG development in this area has caused the groundwater levels to be drawn down more notably over the past 4 years. The 449 producing CBNG wells within the CX Field, Montana, have been completed in the Dietz, Monarch, and Carney coal seams. An additional 24 wells would be added in these coal seams in the Dry Creek area of the CX Field for a total of 487 CBNG wells in these coal seams. Additionally, 2,599 wells have been completed in Sheridan County, Wyoming (Wyoming Oil and Gas Commission Website, November 13, 2004; http://wogcc.state.wy.us). It is estimated that approximately 2,000 of these Wyoming CBNG wells are finished in the Dietz, Monarch and Carney coal seams contiguous with the CBNG development area in Montana.

Ongoing monitoring indicates that “After 4 years of production from the CX field, water levels have been lowered by 20 feet at distances of less than 1 mile to as much as 2 miles from the edge of the field. Within the production areas, water levels are as much as 150 feet lower than baseline conditions. As production continues, and as field sizes enlarge, greater drawdown is expected to occur and at greater distances from the well field.” (Wheaton and Donato, 2004a). The existing 20 foot drawdown in Wyoming can also be estimated from this Montana data, and the distribution of CBNG wells in Wyoming. These existing drawdown areas are shown on Map Hydro-2 in the Hydrology Appendix. According to MBMG's GWIC database and the USGS's NHD dataset, there are 21 domestic or stock wells and 1 spring within the existing 20 foot drawdown contour. This spring and these wells are shown on Map Hydro-2, and listed on Table Hydro-7 in the Hydrology Appendix. The existing drawdown does not extend into the Coal Creek POD area.

Monitoring data from the CX field collected during 4 years provide data against which groundwater drawdown calculations can be calibrated. Charts Hydro-1 to Hydro-4 in the Hydrology appendix show comparisons of observed groundwater drawdown with distance from the well field (dh/r) compared to calculated values when it is assumed that regional aquifer characteristics apply (K=1.1 ft/day and S=9x10-4) and that the drawdown needed to bring hydrostatic pressure to "near the top of the coal seam" can be mathematically represented by a drawdown of 150 feet at 5 feet from a CBNG well at the edge of the field. This is a Theis calculation, and, as such, it applies only as an average distance that drawdown would be expected to extend from the well field. This calculation is for a well at the edge of the well field where the drawdown has been brought to near the top of the coal seam. Since the drawdown with distance is only dependent upon the amount of drawdown at the edge of the field and the aquifer characteristics, this result applies regardless of the number of wells in the field so long as the drawdown at the edge of the field is held near the top of the coal seam. Since these modeled results match well with observed data, this model can be used to project the drawdown which will result from continued development of these wells over time. These confined aquifer calculations will adequately address the drawdown in the coal seam aquifers since the clay rich layers in the Tongue River member of the Fort Union Formation are known to make the vertical hydraulic conductivity of this unit very low (Wheaton and Donato, 2004a). It is known that faults occur in this area; however, the precise locations of all faults are not known. Faults in this area are believed to be boundaries

to groundwater flow (VanVoast and Reiten, 1988). In those areas where the drawdown cone intersects a fault, the cone will be truncated at the fault and the cone will extend asymmetrically away from the fault. It is also likely that the coal seam aquifers are not isotropic in that there is likely to be a preferred flow direction due to the cleat of the coal, and the orientation of secondary fractures; however, the orientation of the cleat and the fractures are not known and it is not known what degree of anisotropy would result from them. As such, it should be noted that the results of this analysis are only applicable as average distances which drawdown of 20 feet or more will reach from the producing field. This approach is appropriate given the purpose of this analysis. It has been determined that 20 feet of drawdown is an appropriate criteria to use in assessing the potential impacts to groundwater resources as a result of CBNG activity (BLM, 2003b). A detailed discussion of this modeling approach is presented in the groundwater modeling report prepared in support of this POD (ALL, 2004).

If the life of a producing CBNG well of 20 years is assumed, then the average projected radius of the 20 foot drawdown contour is 1.6 miles from the edge of the field. This result is also consistent with the observed drawdown related impacts in these same coal seams which have resulted from coal mining in this area. The dewatering resulting from coal mining would be expected to extend somewhat further than that from CBNG since the coal seam is completely dewatered in the coal mine. VanVoast and Retten (1988) report that the radius of the 20 foot drawdown contour from the East and West Decker coal mines extended approximately 1.5 to 3 miles from the edge of the mine after 20 years of dewatering.

If this 1.6 mile radius is applied to the edge of the existing CBNG fields in Montana and Wyoming in this area, the area that would be foreseen to be drawndown by 20 feet or more over the next 20 years from the existing CBNG wells can be determined. This Foreseeable area is shown on Map Hydro-2. The Foreseeable area has an area of 344.8 square miles (mi^2); 64 wells and 6 springs are contained within this foreseeable drawdown area. These wells and springs are listed on Tables Hydro-7 and Hydro-8 in the Hydrology Appendix. There are 43 more wells and 5 more springs within this foreseeable drawdown area than in the existing drawdown area.

Those wells that are finished within the coal seams being developed, and are located within the potential drawdown area, would be anticipated to be impacted by groundwater drawdown. Those springs which emit from the developed coal seam and are located within the potential drawdown area would be anticipated to be impacted by groundwater drawdown. Wells and springs that are impacted by groundwater drawdown would experience a decrease in yields; however, they would not be anticipated to go dry since the coal would remain saturated, but depressurized.

Monitoring will be the key to determining if actual impacts are occurring. Monitoring wells are in place in this area, and they are being monitored by the Montana Bureau of Mines and Geology. MBOGC Order 99-99 also requires the monitoring of potentially affected water sources by the CBNG operator. Fidelity has prepared and submitted annual groundwater monitoring reports to the Technical Advisory Committee (TAC) as required by MBOGC Order 99-99.

The operator has certified that, in compliance with MBOGC Order 99-99 (Designation of the Powder River Basin Controlled Groundwater Area), executed water mitigation agreements are in place. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater, and to extend this area one-half mile beyond any well adversely affected. These mitigation agreements apply to any spring or well adversely impacted by CBNG development.

Based upon water analysis from the existing CBNG production in this area (the east side of the Tongue River), the produced water is anticipated to have an SAR of approximately 58.5 and an EC of approximately 2,248 µS/cm.

For additional general information on groundwater, refer to the MT FEIS (BLM, 2003), Chapter 3, Affected Environment pages 3-22 through 3-39 (ground water), the 2D modeling report (Wheaton and Metesh, 2001) and the 3D modeling report (Wheaton and Metesh, 2002). Groundwater monitoring

information relating to CBNG development is also available by logging into MBMG's online GWIC database (http://mbmggwic.mtech.edu/) and using the Ground-Water Projects link. The most recent CBNG groundwater monitoring report (Wheaton and Donato, 2004a) is also available online (http://www.mbmg.mtech.edu/pdf-open-files/mbmg508.pdf).

3.5 INDIAN TRUST AND NATIVE AMERICAN CONCERNS

Indian Trust Assets are defined as "lands, natural resources, money, or other assets held by the federal government in trust or that restricted against alienation for Indian Tribes and individual Indians (DM 302, 2.5)". No Indian lands or Indian owned leases are present in the project area. The Northern Cheyenne Tribe has a Class I PSD Airshed for the reservation and has water rights under the Winters Doctrine on the Tongue River. BLM has a Trust responsibility to ensure that these are not impaired by the proposed developments. Additionally, the Miles City Field Office has both met with the Northern Cheyenne Tribe and sent letters introducing this project. The Northern Cheyenne Tribe has previously expressed concerns with impacts to Air Quality, Water Quality, Impacts to Cultural Resources and Impacts to Wildlife. The concerns raised by the Northern Cheyenne Tribe are addressed in the Air Quality, Cultural Resources, Hydrology and Wildlife Sections of this EA. The project area is located approximately 10 miles east of the Crow Reservation and some 20 miles south of the Northern Cheyenne Reservation.

3.6 LANDS AND REALTY

The Project area is composed of a mixed ownership of both the surface estate and mineral estate. Ownership of the surface estate and mineral estate is split among BLM, State of Montana, and private. The surface and mineral (oil and gas) acreages are found in Table 3.6-1. There are three authorized R/Ws on the proposed affected Federal surface. R/W MTM92853 was issued to Fidelity for a two-track unbladed access road in T. 9 S., R. 41E., Section 21, S½NW¼, E½SW¼; Section 27, SW¼SW¼; Section 28, W½NE¼, SE¼NE¼, NE¼NW¼, E½SE¼. R/W MTM49897 was issued to Big Horn County for a County Road and R/W MTM59032 was issued to Range Telephone Cooperative for a buried telephone line south of and along the County Road, both in Lot 5, Section 19, T. 9 S., R. 41 E. The entire project area is within the Powder River Basin Known Coal Leasing Area (KCLA). There are no withdrawals or mining claims affecting the subject federal land.

Table 3.6-1
Surface & Mineral Ownership

Surface	Appx. Acres	Mineral	Appx. Acres
BLM	2,840	BLM	7,480
State	640	State	640
Private	6,840	Private	2,200
Project Area Total	10,320	Project Area Total	10,320

3.7 LIVESTOCK GRAZING

Livestock grazing is the principal economic use of land in the project area. There are two livestock operations in the project area. Currently, the livestock operations within the project area run approximately 200 cow/calf pairs. The livestock seasons of use varies depending on each operation. Available water is somewhat limiting to these livestock operations.

3.8 RECREATION AND VRM

Recreation in this part of the planning area is probably fall hunting of big game. But this casual use activity is complicated by the fact that the block of federal surface does not have legal public access. As for the VRM resource, this landscape terrain usually grades out as Management Class III type property. It is not unique in character but the overall condition of the area is pastoral and rural. Evidence of man is slight to moderate.

3.9 SOCIAL AND ECONOMIC CONDITIONS

The project area is within the producing CX Field located in the southeastern corner of Big Horn County, just south of the Tongue River Reservoir, and adjacent to the southwest corner of Rosebud County. The project area is ten miles east of the Crow Reservation, approximately twenty miles south of the Northern Cheyenne Reservation and thirty-five miles by paved road from Sheridan, Wyoming. A description of the social, economic and fiscal

conditions on the Reservations and Big Horn and Rosebud Counties are found in the Affected Environment, Chapter 3 and the Socioeconomic Appendix of the MT FEIS. The proposed action is to drill and produce the Dietz, Carney, and Monarch coal zones. The MBOGC reported natural gas production in Big Horn county in 2002 was 9,679,910 MCF (DNRC Annual Review 2002, page 19), approximately 11 percent of total statewide production. However, oil and gas production taxes contributed less than one-tenth of one percent of County revenues in FY 1999 (MT FEIS 2003, Socioeconomics Appendix, Table SEA-1). The Minerals Management Service reported Big Horn County Federal gas production of 258,209 MCF in FY2001, latest data available, with royalty payments of $118,646.

3.9.1 Environmental Justice

Big Horn and Rosebud Counties include Indian reservations with substantial Native American populations based on the 2000 census data, in Big Horn County, the population is 60 percent Native American. This county includes most of the Crow Reservation and part of the Northern Cheyenne Reservation. Slightly over 35% of Rosebud County is Native American. This county is located north of the project area and includes the part of the Northern Cheyenne Reservation not located in Big Horn County. In 2000, over 5,000 Native Americans lived on the Crow Reservation and over 4000 Native Americans lived on the Northern Cheyenne Reservation.

In 2000, 24% of the population living in Big Horn County and 17% of the population in Rosebud County had incomes below the poverty level. These figures compare to a state wide figure of 13% and reflect the relatively large numbers of persons on the reservations living in poverty.

3.10 SOILS

Soils within project area were identified from the *Soil Survey of Big Horn County Area, Montana* (USDA, 1977). The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis was included in Fidelity's POD from the published soil survey and the National Soils Information System (NASIS) database for the area. Information in the POD includes a soil map, general soils descriptions, official series descriptions, chemical properties, physical properties, rangeland productivity, plant communities, and erosion related attributes.

The soils physical and chemical properties as well as spatial distribution within the POD boundaries were evaluated to assure soil health and productivity are maintained or effects minimized. The soils and impacts were evaluated using the NRCS UDSA Soil Data Viewer software using NASIS data.

Soils in the project area have developed in colluvium and residuum derived from the Tongue River Member of the Tertiary Fort Union Formation and the Eocene Wasatch Formation. Lithology of these units consists light to dark yellow and tan siltstone and sandstones with coal seams in a matrix of shale. In some areas, the near surface coals have burned, baking the surrounding rock, producing red, hard fragments called clinker. Differences in lithology have produced the topographic and geomorphic variations seen in the area. Higher ridges and hills are often protected by an erosion-resistant cap of clinker or sandstone. Soils within the area are distributed according to differences in parent material (both residual and depositional), elevation, moisture, and topographic slope and position.

Soils are deep, greater than 40 inches, on alluvial fans, basins, and valley alluvium. Shallow soils, less than 20 inches, occur on plains and ravines underlain by sandstone, siltstone, and shale bedrock as well as in areas with steeper topography. Moderately deep soils are those considered between 20 and 40 inches; these soils generally lie on residual upland plains and relatively gentle sideslopes.

Soil units potentially affected by the proposed action include:

Cushman soils consist of well drained soils that are moderately deep to bedrock. These soils formed in slopewash alluvium and residuum from interbedded shales and siltstone and fine-grained argillaceous sandstone. Cushman soils are on buttes, fan remnants, hills, piedmonts, ridges and terraces. Slopes are 0 to 20 percent.

Fort Collins soils consists of very deep (>60 inches), well drained soils that formed in mixed eolian sediments and alluvium. Fort Collins soils are on terraces, hills, plains, and alluvial

fans and have slopes of 0 to 10 percent.

Haverson soils consist of very deep (>60 inches), well drained soils that formed in alluvium from mixed sources. Haverson soils are on floodplains and low terraces and have slopes of 0 to 9 percent.

Hydro soils are very deep (>60 inches), well drained soils on terraces and footslopes. Slopes are 0 to 15 percent.

Midway soils are shallow (<20 inches), well drained soils that formed in residuum and slope alluvium from calcareous platy shale. Theses soils formed on ridge crests, mesas, plains, and hills in shale uplands. Slopes range from 0 to 40 percent.

Morton soils consists of moderately deep (20 inches - 40 inches), well drained, moderately permeable soils that formed in material weathered from soft calcareous silty shales, siltstones, and fine grained sandstones. These soils are on uplands and have slopes of 0 to 15 percent.

Nelson soils are moderately deep (20 inches - 40 inches), well drained soils that formed in residuum from soft, calcareous sandstone. These soils formed on hill sides and ridges with slopes from 2 to 12 percent.

The Olney series consists of very deep (>60 inches), well drained soils that formed in eolian material. The Olney soils are on hills and plains and have slope gradients of 0 to 15 percent.

Renohill soils consists of well drained soils that are moderately deep (20 inches - 40 inches) to soft bedrock. These soils formed in alluvium, colluvium, and residuum. Renohill soils are on bedrock controlled plateaus, hills and ridges. Slopes are 0 to 30 percent.

Terry soils consists of moderately deep, well drained rapidly permeable soils that formed in parent sediments weathered residually from underlying soft sandstone. Terry soils are on hills and ridges and have slopes of 0 to 30 percent.

Thedalund soils are moderately deep (20 inches - 40 inches), well drained, moderately permeable soils formed in thick calcareous alluvial materials. Thedalund soils are on hills and ridges and have slopes of 0 to 30 percent.

Travessilla soils are very shallow (<10 inches) and shallow (<20 inches), well drained soils that formed in calcareous eolian sediments and material weathered from sandstone. These soils are on hills, cuestas, scarps, and mesas with slopes ranging from 0 to 75 percent.

Wibaux soils consist of very deep, well drained soils formed in colluvium and alluvium derived from porcelanite. Wibaux soils are on hillslopes, knolls and ridges. Slopes range from 0 to 75 percent.

Thurlow soils are very deep (>60 inches), well drained soils that formed in calcareous clay loam unconsolidated materials. These soils formed in valleys on river and stream terraces with slopes from 0 to 15 percent.

Hydrologic groups range from A to C indicating low runoff potential, however rutting hazard is high due to low soil strength.

Fort Collins loam, 2 to 4 percent slopes, Haverson loam, 0 to 2 percent slopes are considered prime farmland if irrigated. There are no hydric soils in the area. There is no flooding or ponding hazard for these soils.

The existing off-channel impoundment, 23-0299, is underlain by two, low-permeable clay materials. The two soil types that have been mapped in the area of the impoundment are the Renohill and Winnett soils. The Renohill soil is a silty clay with a high shrink-swell potential and bedrock at a depth of 20 to 40 inches. The Winnett soil is a clay soil with a high shrink-swell potential and bedrock at a depth of 20 to 40 inches. The surface and near surface clays at this site are anticipated to limit subsurface infiltration.

The site of the proposed off-channel impoundment, 44-3490, is underlain by two, low-permeable clay materials. The two soil types that have been mapped in the area of the impoundment are the Thedalund and Midway soils. The Midway soil is a silty clay with a moderate shrink-swell potential and bedrock at a depth of 20 inches. The Thedalund soil is a clay loam with a low shrink-swell potential and bedrock at a depth of 20 to 40 inches. The surface and near surface clays at this site are anticipated to limit subsurface infiltration; however, the impoundment would be lined with

impermeable clay to further prohibit infiltration of stored water.

3.11 VEGETATION

The project area is an upland community dominated by grasses but includes shrubs and trees. Dominant upland species include bluebunch wheatgrass (*Agropyron spicatum)*, western wheatgrass (*Agropyron smithii)*, green needlegrass (*Stipa viridula)*, blue grama *(Bouteloua gracilis)*, needle and thread (*Stipa comata)*, prickly pear cactus (*Opuntia spp.)*, big sagebrush (*Artemisia tridentata)*, Ponderosa pine (*Pinus pondersosa)*, Rocky Mountain juniper (*Juniperus scopulorum).* Differences in dominant species within the project area vary with soil type, aspect and topography.

There are no known threatened or endangered plant species in the project area. However, three plant species identified on the Montana Plant Species of Concern list have been recorded in outlying areas (Barton & Crispin, 2003). Two species Barr's milkvetch (*Astragalus barrii*) and Nuttall's desert-parsley (*Lomatium nuttallii*) are both identified as Montana Species of Concern and regional endemics and are designated Watch Species by the BLM in Montana. The third plant species, *Woolly twinpod (Physaria didymocarpa* var. *lanata*), is a regional endemic. The habitats where these three species have been recorded consist of sparse vegetation, which includes Ponderosa pine, Rocky Mountain juniper, blue bunch wheatgrass, western wheatgrass, big sagebrush and rabbitbrush (*Chrysothamnus spp.)* Typically, these species are found on rocky slopes of sandstone, siltstone, or clayey shale, in open pine woodlands.

Irrigation of alfalfa occurs in the western portion of Section 23 along the Tongue River.

3.11.1 Invasive Species

No state-listed noxious weeds and invasive/exotic plant infestations were discovered by a search of inventory maps and/or databases or during subsequent field investigation by the proposed project proponent. However, Leafy spurge is common in the area and is spreading rapidly. While not currently occupying the site, it is reasonable to expect this species could occur in the project area in the near future. It is possible for any weed species to invade in any of the areas of surface disturbance.

3.12 WILDLIFE

Wildlife habitat in the project area has not appreciably been altered by human activities; however, some wildlife habitat has been altered by sagebrush treatment and livestock grazing.

Wildlife inventory surveys were conducted throughout the project area in 2003 by Hayden-Wing Associates (Hayden-Wing). The initial report, *Proposed Coal Creek POD, Big Horn, Montana, Baseline Wildlife Inventory 2003* was prepared and submitted to BLM on December 23, 2003, and a final version was submitted on April 12, 2004. Additionally, BLM biologists have evaluated the area for wildlife values, and BLM has contracted a raptor survey in the area of potential CBNG development in southern Big Horn County in Montana. The following sections describe the wildlife values in the project area as a result of completed and continuing inventories.

3.12.1 Threatened, Endangered, and Special Status Species

No active (or inactive) bald eagle nests were located within the Coal Creek project area or within a one-mile radius around the project area during the May, 2003 surveys conducted by Hayden-Wing (Hayden-Wing April 12, 2004). However, one active bald eagle nest was located approximately 1.6 miles southwest of the project area. The bald eagle is listed as a threatened species under the Endangered Species Act of 1973, as amended in 1982 (ESA), and as such is subject to federal regulations and guidelines to implement the species recovery. BLM stipulations as stated in the MT FEIS require a No Surface Occupancy (NSO) within ½ mile of nests that have been active during the past 7 years.

Winter roost surveys were conducted on January 30, 2003, and 53 bald eagles (21 adults, 32 juveniles) were observed (Hayden-Wing April 12, 2004). Bald eagles were found throughout the entire length of the survey area along the Tongue River and it appears that the entire section of the river surveyed provided suitable winter habitat and roosting sites for bald eagles. No eagles were noted within ½ mile of the western boundary of the POD, and no eagles were observed in the uplands during the flight.

Three winter bald eagle surveys were conducted in December, 2003, and a total of 43 bald eagles were documented (24 adults, 19 adults). All but

one of the eagles was located outside the one-mile survey radius around the project area. One juvenile bald eagle was located just outside the western boundary of the project area, within the one-mile survey raduis (Hayden-Wing April 12, 2004). Again no eagles were noted in the uplands during the survey flights. The surveyed riverine habitat provides suitable bald eagle winter habitat and roosting sites for bald eagles. No nests large enough to be eagle nests were located during the aerial surveys of the Coal Creek POD and its one-mile buffer.

Both overhead and buried power lines are proposed for the project area. The figures presented in Table 2.5-1 for overhead and buried power lines reflect the stretches of the power lines which require rights-of-way. Throughout the POD, however, there are proposed, 12.35 miles of overhead power lines (2.97 miles Federal; 1.52 miles State; 7.86 miles Private), 14.67 miles of underground power lines (6.21 miles Federal; 1.30 miles State; 7.16 miles Private), and 3.16 miles of underground high voltage power line (1.81 miles Federal; 0 miles State; 1.35 miles Private). Approximately 1.8 miles of overhead power line parallel the County road which runs along the north edge of the project area.

3.12.2 Big Game Species

Mule deer are found year-round in the project area and the area is considered important mule deer habitat. "Crucial" winter range was identified in the eastern section of this project. White-tailed deer are commonly found along the Tongue River corridor. Antelope use the benchlands and more open topography located in the project area. Other big game, including elk, black bear and mountain lion, use the area as transitory habitat as they travel between more preferred habitats. Elk are more commonly observed in the area than in past years, but both black bears and mountain lions are only infrequently seen.

3.12.3 Upland Game Birds

The project area is considered good sharp-tailed grouse habitat. There are 7 sharp-tailed grouse leks and 1 sage grouse lek within or adjacent to the project area. All sharp-tailed leks are considered active, but were not surveyed in 2003. The sage grouse lek within the project area is considered inactive, but it also was not surveyed in 2003. Sage grouse, a Montana BLM Special Status Species (SSS), are found throughout the project area in suitable nesting habitat. Wild turkeys are year-round residents and nest throughout adjacent ponderosa pine uplands and riparian areas.

3.12.4 Raptors

An active bald eagle nest is located within 1.6 miles of the project area along the Tongue River. Additionally, the existing powerline passes within 100 yards of the nest as it proceeds downriver. Several power poles offer perch opportunities for eagles in this area. Bald eagles commonly migrate through the Tongue River valley and will winter in the river corridor as long as open water and forage remains available. This area is considered good habitat for a number of raptor species. A 2003 survey of the project area by Hayden-Wing identified several red-tailed hawk nests, a great-horned owl nest within the project area, and several osprey and red-tailed hawk nests and an active bald eagle nest along the Tongue River, outside the project area. A more comprehensive raptor survey of the potential CBNG development area in southern Big Horn County, Montana, was conducted in 2004 by Greystone Environmental Consultants, under a contract to BLM. This survey did not identify additional nests within the project area, but a new active golden eagle nest in a dead ponderosa pine snag, and a new inactive red-tailed hawk nest in a ponderosa pine tree were identified east of the project area.

3.12.5 Migratory Bird Species

The Montana Natural Heritage Program identified 104 species of birds inhabiting this portion of Southeast Montana and another 55 species as probable/possible inhabitants (Carlsen and Cooper, 2003). BLM commissioned 2 breeding bird surveys in the area of the project in 2002 and 2003. Seven transects recorded 49 species of which western meadowlarks, lark/vesper /Brewer's sparrows black-billed magpies, rock wrens, and brown-headed cowbirds were the most common species represented. From 4 of these transects, 48 Brewer's sparrows were counted and from 1 transect, 1 loggerhead shrike was observed, both on the BLM state sensitive species list. Hayden-Wing identified active great blue heron and double-breasted cormorant rookeries within one mile of the project area during 2003 wildlife baseline surveys. These rookeries are located on private surface/mineral estate. Appendix B includes a tabular summary of all Montana BLM bird species of special concern. Included in this

summary is an analysis of potential habitat and possible occurrences of these species in the project area. These species are in very low numbers or simply have not been documented at this time. These may include, but not limited to, Swainson's hawk, hairy woodpecker, loggerhead shrike, and others as shown in Appendix B.

The Tongue River is important habitat for waterfowl. Canada geese, wood ducks, gadwall and mallards commonly nest along the river corridor. The river serves as an important migration corridor for waterfowl during early winter and spring and will support large numbers of ducks, especially mallards, until covered by ice.

3.12.6 BLM Sensitive Species

BLM uses the term Special Status Species (SSS) to identify any species which has been elevated to any degree of management concern, including species listed as threatened, endangered, or proposed for listing under the federal Endangered Species Act (ESA), species listed by the BLM state director as sensitive, species listed by the state wildlife agency, or species identified by a state heritage program. It is important not to interpret a designation of special status species as exclusively meaning a species protected by the ESA. Each BLM State Director has the authority to identify a list of state Sensitive Species for which additional management concern is directed. The Montana/Dakotas Sensitive Species List was issued July 28, 2004 (Instruction Memorandum No. MT-2004-082).

There are several BLM sensitive species of mammals that may occur in the area, but they are extremely rare and/or documentation is nearly non-existent (Foresman, 2001). These include Preble's and Merriam's shrews and spotted and Townsend's big-eared bats. Refer to the table in Appendix B for an accounting of all Montana BLM SSS-listed species.

3.12.7 Fisheries/Aquatics

The Tongue River upstream of Tongue River Dam supports a major recreational fishery. Key species include smallmouth bass, sauger, and channel catfish. Fifteen fish species have been identified in this portion of the Tongue River (refer to http://maps2.nris.state.mt.us/). There were 14 fish species identified in the river upstream of the Tongue River Reservoir (RM 200.7 to RM 206.7) through electroshocking in 2004. The sauger is the only sensitive fish species within and immediately downstream of the project area. The Northern Leopard Frog, spiney softshell, snapping turtle, Plains spadefoot, and Great Plains Toad are all sensitive aquatic dependent species that may occur in aquatic habitats near the project area. In addition to the above aquatic species, there are also other amphibians and aquatic invertebrates that are common in and along the Tongue River and many of its tributaries.

Macro-invertebrates, fish, periphyton, instream habitat, and riparian habitat were surveyed for existing baseline condition at two sites on the Tongue River (in between the reservoir and the state line) from July 26-27, 2004, (BLM preliminary data, 2004). These two sites are located on the Tongue River at the state line (T. 9 S., R. 40 E., Section 31) and Tongue River near the bridge (T. 9 S., R. 40 E., Section 27). Most of the above data is currently being analyzed and will not be available until March of 2005. Preliminary observations indicated a variety of fish, invertebrates, and amphibians. The summary determination for rating streams (BLM, 1998) indicated that the above sites surveyed were functioning at risk in an upward trend. The upward trend was evident through revegetating streambanks and new shrub/tree recruitment. The impacts that attributed to the functioning at risk rating were unstable streambanks and lack of riparian vegetation in some areas. Additional sampling for aquatic invertebrates was completed by the USGS on the Tongue River at the state line (upstream of the reservoir) and the Tongue River at Brandenburg Bridge (approximately 85 - 95 stream miles downstream of the project area) in 2003. In fast-flowing habitats, the most abundant taxa for the site near Brandenburg Bridge were Ephemeroptera (49%) and Tricoptera (27%). The Tongue River at the State Line site consisted of Ephemeroptera (62%), Miscellaneous Diptera (aquatic flies) (12%) and Coleptera (aquatic beetles)(11%).

The point of produced water discharge for this project is located in between the reservoir and the state line. Proposed CBNG discharge will be between 61 and 68 degrees F. The water will be meet state standards (i.e. EC, SAR). Other ions and anions, such as bicarbonate and ammonia, etc. will also meet state standards and guidelines by using a mixing zone within the Tongue River, which will provide protection and limit effects to aquatic life. The water

discharged will not exceed the current amount permitted by MDEQ. Refer to 3.41 Hydrology for other water quality information.

The existing fields of CBNG development in Montana and Wyoming could impact 6 springs within the 20 foot drawdown contour over the next 20 years (see Section 3.4.2). These springs have not been surveyed for aquatic species; however, it is reasonable to assume that various aquatic species and amphibians use these springs to rear and reproduce.

3.12.8 West Nile Virus

West Nile Virus (WNV) is a mosquito-borne disease that can cause encephalitis and other brainstem diseases in humans and a major impact on vertebrate wildlife populations. WNV was identified as a mortality factor in a sage grouse population near Gillette, WY in 2003. This population is part of a research project evaluating CBNG development impacts to sage grouse populations in southeast Montana and northeast Wyoming. WNV is spread when mosquitoes feed on infected birds, and then people and other birds and animals. WNV is not spread by person-to-person contact and there is no evidence people can get the virus by handling infected animals.

Mosquitoes can potentially breed in any standing water that lasts for more than 4 days. Surface water availability has increased with CBNG development in the Powder River Basin, which includes the proposed project area. WNV has been identified in mosquitoes trapped in and around CBNG produced water reservoirs in the vicinity of the sage grouse mortalities (B. Walker, personal communication). Research on this issue is currently being conducted by several entities (WY Veterinary lab, University of Montana, Montana State University, USDA, and the University of Alberta).

Other factors that may be influencing WNV are the irrigation adjacent to the Tongue River, stock water reservoirs and troughs, natural wetlands and various environmental influences.